

Health Consultation

**Assessment of Sampling Data and Health Implications of
Operable Unit 05 (Old Hat Factory)**

Southeast Corner of Maupin Avenue and Wall Street Intersection

RIVERFRONT
(a/k/a NEW HAVEN PUBLIC WATER SUPPLY SITE)

NEW HAVEN, FRANKLIN COUNTY, MISSOURI

EPA FACILITY ID: MOD981720246

OCTOBER 29, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

Missouri Department of Health and Senior Services
Division of Community and Public Health
Bureau of Environmental Epidemiology
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

STATEMENT OF ISSUES AND BACKGROUND

Statement of Issues

The Missouri Department of Health and Senior Services (DHSS), in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), has prepared this health consultation to evaluate the sampling data and possible health implications of Operable Unit 05 (the “old hat factory”) at the Riverfront (a/k/a New Haven Public Water Supply Site) Superfund site in New Haven, Missouri. DHSS has reviewed analytical sample data of the soil and groundwater taken during evaluation of the site as a possible source of tetrachloroethylene (PCE) contamination that affected both of New Haven’s municipal wells. These two contaminated wells were shut down and two new uncontaminated municipal wells now supply New Haven’s drinking water.

Background

The Riverfront Superfund site is located in New Haven, Franklin County, Missouri (See Figure 1), which is adjacent to the Missouri River and approximately 50 miles west of St. Louis, Missouri on Missouri State Highway 100. The Riverfront site was discovered after water sampling by the Missouri Department of Natural Resources on June 30, 1986, detected tetrachloroethylene (PCE) in one of New Haven’s two original municipal wells. PCE was found above the U.S. Environmental Protection Agency’s (EPA) Maximum Contaminant Level (MCL) of 5 parts per billion (ppb). The MCL is the highest level of a contaminant that EPA allows in public drinking water. Continued sampling confirmed the presence of PCE contamination in the both of the two public wells, which were eventually shut down as new uncontaminated municipal wells were put into service to replace them. These two new wells are the only source of public drinking water for the more than 1,800 residents of New Haven. The site was proposed to EPA’s National Priorities List (NPL) on July 27, 2000 and officially listed on December 01, 2000 (1).

Previous investigations into the source(s) of the PCE contamination and its possible degradation products (trichloroethylene (TCE), cis-1,2-dichloroethylene, and vinyl chloride) found multiple potential source areas that could have contaminated the city wells. Because of the multiple potential source areas, the Riverfront site was divided into six Operable Units (OUs) for further individual investigations (See Figure 2). For more information on the six Operable Units, see the April 8, 2004 ATSDR Riverfront (a/k/a New Haven Public Water Supply Site) Public Health Assessment, New Haven, Franklin County, Missouri (1).

The U.S. Geological Survey (USGS) conducted the Focused Remedial Investigation for OU-5 to determine if the “old hat factory” was a possible source of the PCE contamination that had affected the original two city wells (2). This health consultation evaluates the sampling data and possible health implications at OU-5 (the “old hat factory”).

The old hat factory (OU-5) is located at the southeast corner of the Maupin Avenue and Wall Street intersection, south of downtown New Haven. OU-5 is located on a 1.9-acre parcel of land in a mostly residential area that sits on a bluff overlooking downtown New Haven and the Missouri River (See Figure 3). The area to the east of OU-5 slopes steeply downgradient toward downtown New Haven and the Missouri River. The original portion of the building was constructed sometime in the mid to late 1800s and served as a dry goods store. In the late 1800s, the building was extended south and the entire building was used as an “opera house” and community hall.

In 1928, the Langenberg Hat Company purchased the building and began operations in New Haven until the company entered bankruptcy and the facility was closed permanently in 2000. During its time of operation, several additions and modifications were added to the building to increase its size. The company dyed, formed, and shaped fur into hats from stock materials manufactured at other locations. No tanning operations were done at this facility. During the times of peak operation, the company produced and shipped nearly 500,000 hats domestically and around the world yearly.

In 2002, the property was purchased by a local individual who intended to restore the original opera house portion of the building and demolish the rest of the hat factory. Demolition began in 2003 and continues with only the original opera house and a metal office building on the south side of the opera house remaining. A carpentry shop is leasing the metal office building. The site has been re-graded, an unknown amount of soil removed, topsoil added and the site reseeded (2,3). See Figure 4 for a comparison of the old hat factory and restoration of the site.

Groundwater Investigations

The initial investigation of OU-5 was to rule out the hat factory as a possible source of the PCE contamination discovered in the nearby municipal wells. Information collected during early investigations did not find the use of PCE by the hat factory. To confirm that the hat factory was not a source, soil samples were taken during installation of a 19 feet deep monitoring well at a downgradient location. No PCE, its degradation products, or other volatile organic compounds (VOCs) were detected. The 19 feet monitoring well was later developed into a 48 feet deep monitoring well the following spring of 2002. A groundwater sample from the well found PCE at 140 ppb in laboratory analysis.

Because of this unexpected detection of PCE, a second shallow monitoring well (51.5 feet) was installed 250 feet south of OU-5, to be used to determine background PCE levels in groundwater. To confirm that OU-5 was not the source of PCE contamination of the city wells, a deeper (185 feet) monitoring well was placed next to the first monitoring well. This well was designed to monitor groundwater in the deeper bedrock beneath OU-5, but still be shallow enough not to intersect the deeper groundwater that was contaminated by another source. The other source is expected to have contaminated the deep groundwater that moves toward the Missouri River and is possibly a source of the contamination of the original two municipal wells. Sampling of the background well and the OU-5 deep well found PCE to be less than 0.5 ppb. The shallow OU-5

well that previously had contained 140 ppb when drilling was completed, showed PCE values had decreased to 49 ppb in 2002 and to 27 ppb in 2004. Continued sampling of this shallow OU-5 well detected a peak value of 110 ppb in February 2005, but the level of PCE decreased to 52 ppb in June 2005 (2). This peak value of 110 ppb in the shallow OU-5 well may be related to disturbance of the soils at the site during demolition of the old hat factory.

Soil Investigations

After detecting levels of PCE in the groundwater of the shallow (48 feet) downgradient monitoring well at OU-5, an investigation was conducted to determine if a source area was present on the OU-5 site. To determine if soil on the OU-5 site was contaminated with PCE, soil samples were taken from 25 soil borings, including soil samples beneath parking lots, driveways, and the concrete floor of the building. Soil borings ranged from 3.8 to 23.6 feet deep and focused on areas where PCE may have been used or disposed of by operations at the “old hat factory”. Samples generally were collected every two feet of depth and screened for VOCs using a portable gas chromatograph (GC). Thirty samples from the boreholes were sent for laboratory analyses of VOCs, semi-volatile organic compounds (SVOC) and trace elements. Three samples had detectable levels of PCE, with the maximum level of PCE being 55 ppb (2). The only trace element detected was arsenic in three samples above the average Franklin County background level of 11 ppm (5). The maximum level of arsenic in these samples was 12 ppm (2).

Sewer Investigations

In previous investigations and sampling events, EPA had detected PCE in the New Haven’s sanitary sewers. Sewage is pumped by lift stations from the south area where, during the late 1970s and early 1980s, PCE was routinely dumped into floor drains at OU-2. These floor drains connected to the city’s sanitary sewer system and levels of PCE were found to decrease as distance from OU-2 increased. Sampling of the sanitary sewer was conducted to determine if this could be a source of the PCE found at OU-5. The sanitary sewer actually runs under a portion of the site as it approaches from the south, makes a 90-degree bend to the east under the site and then turns back north. Sampling of the sewer system between 2001 and 2004 found PCE at a maximum level of 5.0 ppb in the vicinity of OU-5 (2). Levels of PCE during the times that PCE was dumped into the city sewers are expected to have been at a much higher level.

Stream Investigation

Surface water samples were taken of two tributary streams located to the northwest and southeast of OU-5 as part of the initial EPA investigations in 2000 and 2001 (See Figure 3). Results of the testing found PCE levels at the source of the southeast stream at Bates Spring at a maximum of 5.44 ppb. Levels of PCE quickly dropped off to non-detectable away from the spring. Samples of the stream were again taken in 2005 down slope of OU-5 and again PCE was found to be non-

detectable. Bates Spring is located approximately 750 feet south of OU-5 and is expected to drain other areas than OU-5. The PCE detected at Bates Spring is most likely from another source (2).

In September 2006, EPA announced its proposed plan to address contamination at the OU-5 site and held a public meeting to present its proposed plan to the public. On December 7, 2006, EPA signed a Record of Decision (ROD) that stated their selected remedy for the OU-5 site. Actions to be taken as part of the ROD include the installation of a background well along with an additional monitoring well. Groundwater monitoring is to be continued to track contaminants levels and location of the plume. Monitoring well sampling parameters will include PCE and other volatile organic compounds (3). Institutional controls consisting of deed restrictions to limit land use and provide notice to future owners, well construction restrictions including special well construction requirements for this area by MDNR, and public education are expected to prevent access to the contaminated groundwater (3,6).

DISCUSSION

This section addresses the pathways by which visitors on or residents near the former hat factory (OU-5) may have been or are being exposed to the PCE contamination detected. When a chemical is released into the environment, the release does not always lead to exposure. Exposure only occurs when a chemical comes into contact and enters the body. For a chemical to pose a health risk, a completed exposure pathway must exist that includes uptake by humans through inhalation, ingestion, or dermal absorption.

Soil Discussion

Soil samples have not shown levels of contamination that would affect human health at OU-5. The maximum level of PCE detected in soil was 55 ppb (2). This is over 9,000 times less than ATSDR's Reference Dose Media Evaluation Guide (RMEG) level for a child of 500 parts per million (ppm) and is not considered a health concern (4). Arsenic was also detected in three soil samples above the average Franklin County background level of 11 ppm (5). The maximum level of arsenic in these samples was 12 ppm, which is within the range of typical levels for Franklin County and is not considered a health concern.

Surface Water Discussion

Surface water samples have not shown levels of contamination that would affect human health at OU-5 and the contamination may be coming from another source. The maximum level of PCE detected in Bates Spring was 5.44 ppb, but the level drops quickly to non-detect a short distance from the spring. The maximum levels detected were slightly above the MCL of 5 ppb in drinking water. However, this spring is not a source of drinking water for the public and exposure to contaminants in the spring would be minimal.

Groundwater Discussion

Groundwater contamination has been detected above a comparison values but it is not readily accessible for potable water. Groundwater at OU-5 has been found to be contaminated with PCE at a maximum of 140 ppb and has decreased to 55 ppb in June 2005. Presently there is no known pathway of exposure to the contaminated groundwater on the site. There are no known drinking water wells on or adjacent to OU-5. PCE detected in the shallow groundwater but not in deeper groundwater would indicate the possible presence of a PCE contaminated perched water table (an isolated area of groundwater). USGS considers this water to not be a practical source for domestic use because of its small yield (less than two gallons per minute) (2). MDNR has also issued a well drilling advisory for this area and much of the New Haven area, which restricts where new wells may be sited and how they must be constructed (6). If future development was to take place on the site and a source of potable water was needed, the area is served by the New Haven public water system.

Vapor Intrusion Discussion

PCE is a volatile organic compound that vaporizes easily in air and can vaporize from groundwater through soil and into the atmosphere. Buildings located above a contaminated source of PCE can accumulate levels that are above a health guideline for inhalation. Considering that at OU-5, PCE was detected in groundwater approximately 50 feet below the surface and no residences are located on the property over the detected contamination, vapor intrusion is not expected to be a problem on the OU-5 site.

Of concern are the approximately five residences located on the steep slope, east and downgradient of the site, in the direction of groundwater flow (See Figure 5). PCE contaminated groundwater is expected to flow downgradient from OU-5 toward the Missouri River. Because the steep slope toward the river, the houses on that slope may be closer to the contaminated groundwater, especially those that have basements extending into the ground. Closer proximity to the contaminated groundwater may allow for the greater possibility of vapor intrusion into these homes and the possibility for inhalation of elevated PCE levels in the homes. No soil gas or indoor air sampling has been done to determine if these homes have been affected by vapors that might arise from the PCE contaminated groundwater.

TOXICOLOGICAL EVALUATION

Introduction

This section will discuss the health effects of exposure to site-specific contaminants. To evaluate health effects, ATSDR has developed Minimal Risk Levels (MRL) for contaminants commonly found at hazardous waste sites. The MRL is an estimate of daily human exposure to a

contaminant below which non-cancer, adverse health effects are unlikely to occur. Levels above an MRL do not mean that health effects will definitely occur. Rather, it calls for more investigation into whether health effects may occur. MRLs are developed for each route of exposure, such as ingestion and inhalation, and for the length of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days).

Exposure to PCE can be through inhalation, ingestion, and dermal contact. No exposure to PCE is expected on site, but the potential exists that some residents downgradient from the site are being exposed to PCE through inhalation. This toxicological evaluation section will discuss the possible adverse health effects from long-term exposure to low-levels of PCE contamination in indoor air.

Tetrachloroethylene (PCE) (also known as perchloroethylene or perc)

PCE is a volatile organic compound (VOC) that evaporates easily in air, but stays in soil and groundwater without much decomposition. Because it is heavier than water it can easily travel through soil and into the groundwater. PCE is a synthetic chemical that is widely used for dry cleaning, metal-degreasing, starting material for making other chemicals, and in some consumer products. In air, PCE has a sharp, sweet odor, which most people can begin to smell at around 1,000 parts per billion (ppb) or more (4).

ATSDR has developed an Environmental Media Evaluation Guide/MRL for PCE of 40 ppb for chronic inhalation exposure (greater than 365 days) (4). Whether residents are exposed to greater than that level is unknown since no sampling has been done to determine if there is vapor intrusion of PCE into the residences.

If exposure to PCE is occurring it can cause nervous system effects such as dizziness, headaches, sleepiness, and confusion. Animal studies, conducted with amount much higher amounts than most people are exposed to, show that PCE can cause liver and kidney damage. The degradation products of PCE are trichloroethylene (TCE), cis-1,2-dichloroethylene, and vinyl chloride will have similar health effects if present (4).

Cancer

The American Cancer Society estimates that in the United States, slightly less than half of all men and slightly more than one-third of all women will develop some form of cancer in their lifetime (7). The potential for PCE to cause cancer from ingestion and inhalation exposure is presently under review by the EPA, is classified by the International Agency for Research on Cancer (IARC) as probably carcinogenic to humans (limited human evidence, sufficient evidence in animals) and by National Toxicology Program (NTP) as reasonably anticipated to be a carcinogen. The carcinogenicity of PCE has been documented in animals exposed by inhalation or oral (4). The best summary of the cancer potential of PCE in humans is from ToxProbe: “There is no consensus in the scientific community and regulatory agencies with respect to whether tetrachloroethylene (PCE) induces cancer effects in humans” (8).

Child Health Considerations

ATSDR's recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination in their environment. Children are at greater risk than adults from certain kinds of exposures to hazardous substances because they drink more water, eat more food, and breathe more air than adults per kilogram of body weight, and they have a larger skin surface in proportion to their body volume. They also play outdoors and are more likely to come in contact with soil than adults. In addition, children may get contaminated dirt on their hands, and they may ingest some of the dirt if they do not properly wash their hands before eating. They are also shorter than adults and thus are more exposed to dust, soil, and vapors because they are closer to the ground. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

DHSS and ATSDR evaluated the likelihood for children to be exposed to contaminants detected at the Riverfront OU-5 Superfund site. The site is unrestricted and accessible to children of the neighborhood who may spend time on the site and play in the dirt. Sampling of the soil has shown that PCE levels are below ATSDR's RMEG for a child and arsenic is below ATSDR's Environmental Media Evaluation Guide (EMEG) for a child. Since the sampling occurred, the concrete and asphalt of the manufacturing building has been removed and extensive disturbance and regrading of the soil has taken place. This activity should further lower the level of VOCs in the soil. Children should not have access to the contaminated groundwater, unless it is used for potable water and that activity is very unlikely as previously discussed. If PCE were present in the indoor air of homes downgradient of OU-5, children would be affected similarly but to a greater extent than adults.

CONCLUSIONS

Since the discovery of tetrachloroethylene (PCE) contamination in the city of New Haven's public wells in 1986, the search for the source(s) of the contamination has been ongoing. Operable Unit 5 (the old hat factory) was investigated as a possible source of the PCE contamination. Sampling of the different media has determined that Operable Unit 5 is not the source of the contamination found in the city's two closed public wells, but detectable levels of PCE and arsenic were found to be present in certain media. Levels of PCE contamination found at OU-5 in soils were below a level of health concern. Arsenic in the soil was found in the range of background levels for arsenic in the soil and should pose no health concern. PCE was detected in Bates Spring above the MCL, but this is not a drinking water source. Levels of PCE were found in groundwater from a monitoring well on site at a maximum of 140 ppb when drilled in 2002, but has decreased since that time to 52 ppb in 2005. These levels of PCE in the shallow groundwater if used as potable water would be a health concern, but groundwater at OU-5 is not considered to be a practical source of potable water. Because no exposure of concern to

PCE is presently expected to be occurring from soil, surface water, or groundwater at the OU-5 site, the site is considered a *No Apparent Public Health Hazard* for these media. The category of no apparent public health hazard are sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.

Off-site and on the steep downgradient slope from OU-5 the potential exists that the PCE contaminated groundwater could appear closer to the surface and through vapor intrusion enter the homes on the slope. Because no soil vapor or indoor air sampling has been done to determine if PCE or its degradation products are present in the residences downgradient of the site, the downgradient off-site area is considered an *Indeterminate Public Health Hazard*. The category of indeterminate public health hazard is sites for which no conclusions about the public health hazard can be made because data is lacking.

RECOMMENDATIONS

1. EPA should follow the Record Of Decision (ROD) for Operable Unit 5 that requires monitoring of the groundwater for changes in PCE contamination and its degradation products at OU-5.
2. EPA should evaluate the vapor intrusion pathway for residences downgradient from OU-5. Consideration should be given to sampling indoor air in these residences to determine if levels of PCE or its degradation products are present in indoor air at a level of health concern.

PUBLIC HEALTH ACTION PLAN

This Public Health Action Plan (PHAP) for Operable Unit 05 of the Riverfront Site in New Haven, Missouri contains a description of actions to be taken by the Missouri Department of health and Senior Services (DHSS), the Agency for Toxic Substances and Disease Registry (ATSDR) and other shareholders. The purpose of the PHAP is to ensure that this public health consultation not only identifies public health hazards, but provides an action plan to mitigate and prevent adverse human health effects resulting from past, present, and future exposures to hazard substances at or near the site. Below is a list of commitments of public health actions to be implemented by DHSS, ATSDR, or other stakeholders at the site.

1. DHSS/ATSDR will review additional sampling data from future groundwater monitoring and provide guidance regarding possible health risks.
2. DHSS/ATSDR will coordinate with MDNR/EPA to implement the recommendations in this public health consultation to help prevent future human exposure from OU-5 from occurring.
3. DHSS/ATSDR will continue to address community health concerns and questions as they arise and provide necessary community and health professional education.

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Appendix:

- Figure 1: Riverfront Superfund Site Location Map
- Figure 2: Operable Units at Riverfront Superfund Site
- Figure 3: Operable Unit 5, Riverfront Superfund Site
- Figure 4: Old Hat Factory and Restoration of Opera House
- Figure 5: Residences Downgradient and East of OU-5 and Monitoring Well

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1. Agency for Toxic Substances and Disease Registry. Riverfront (a/k/a New Haven Public Water Supply Site) Public Health Assessment, New Haven, Franklin County, Missouri. EPA Facility ID: MOD981720246. Atlanta: US Department of Health and Human Services; 2004 April 8.
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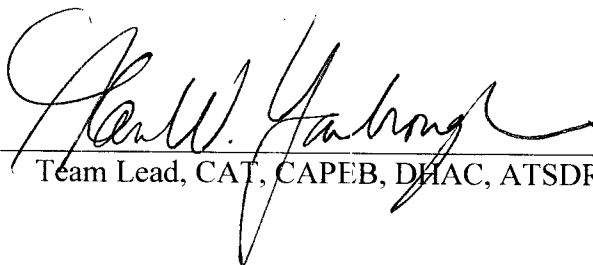
CERTIFICATION

The Missouri Department of Health and Senior Services prepared this Assessment of Sampling Data and Health Implications Of Operable Unit 05 (Old Hat Factory) Health Consultation under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.



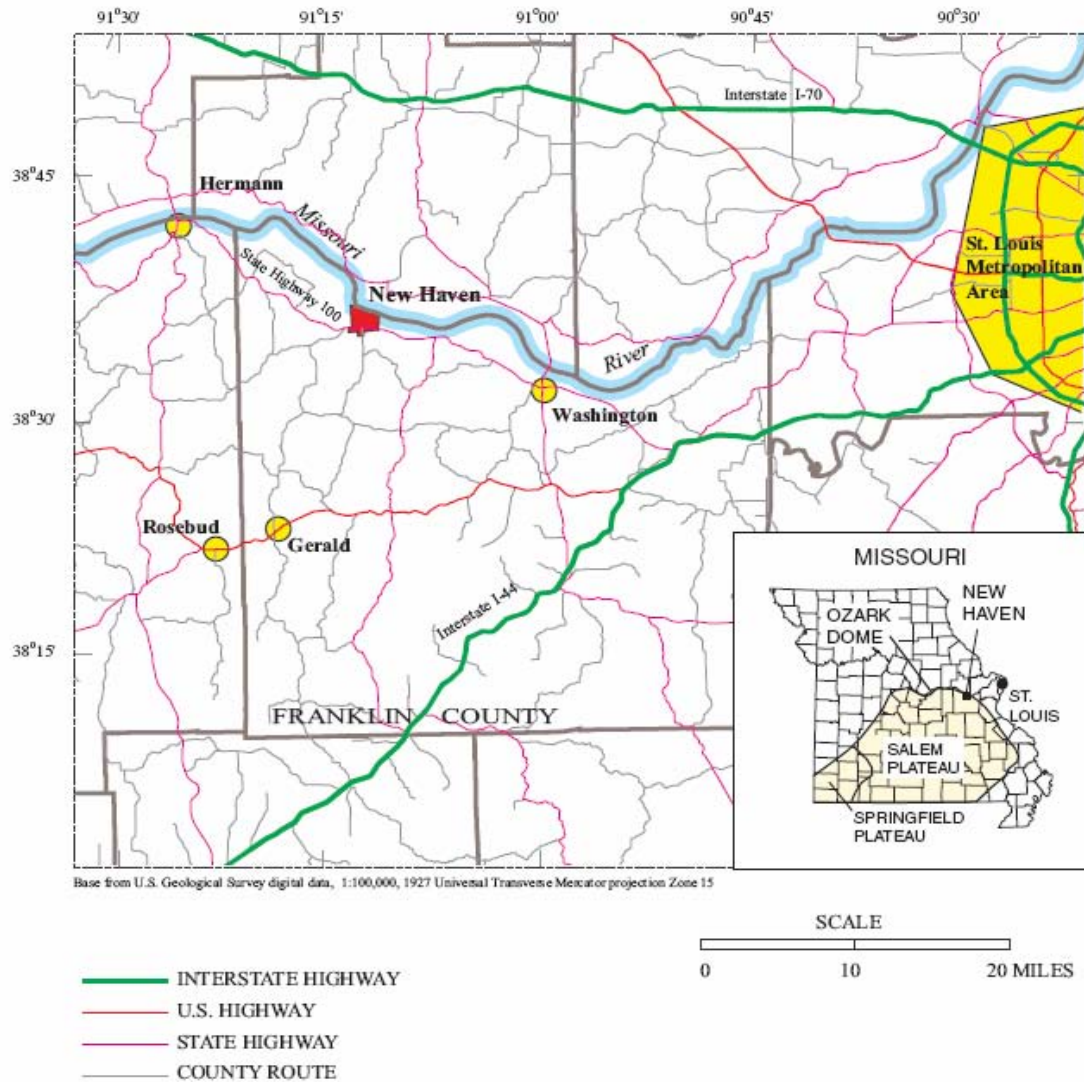
Technical Project Officer, CAT, CAPEB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



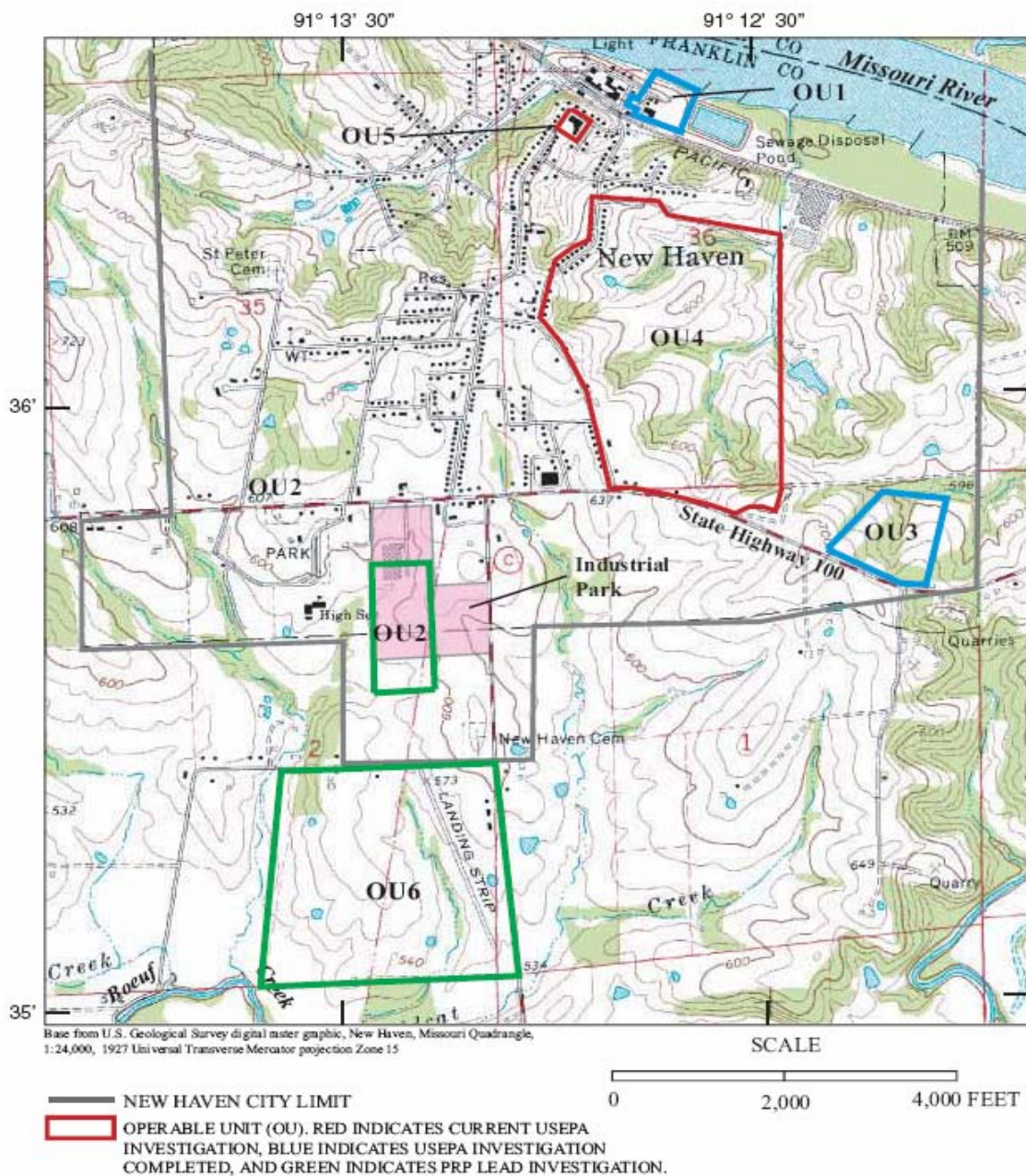
Team Lead, CAT, CAPEB, DHAC, ATSDR

Figure 1
Riverfront Superfund Site Location Map
New Haven, Missouri



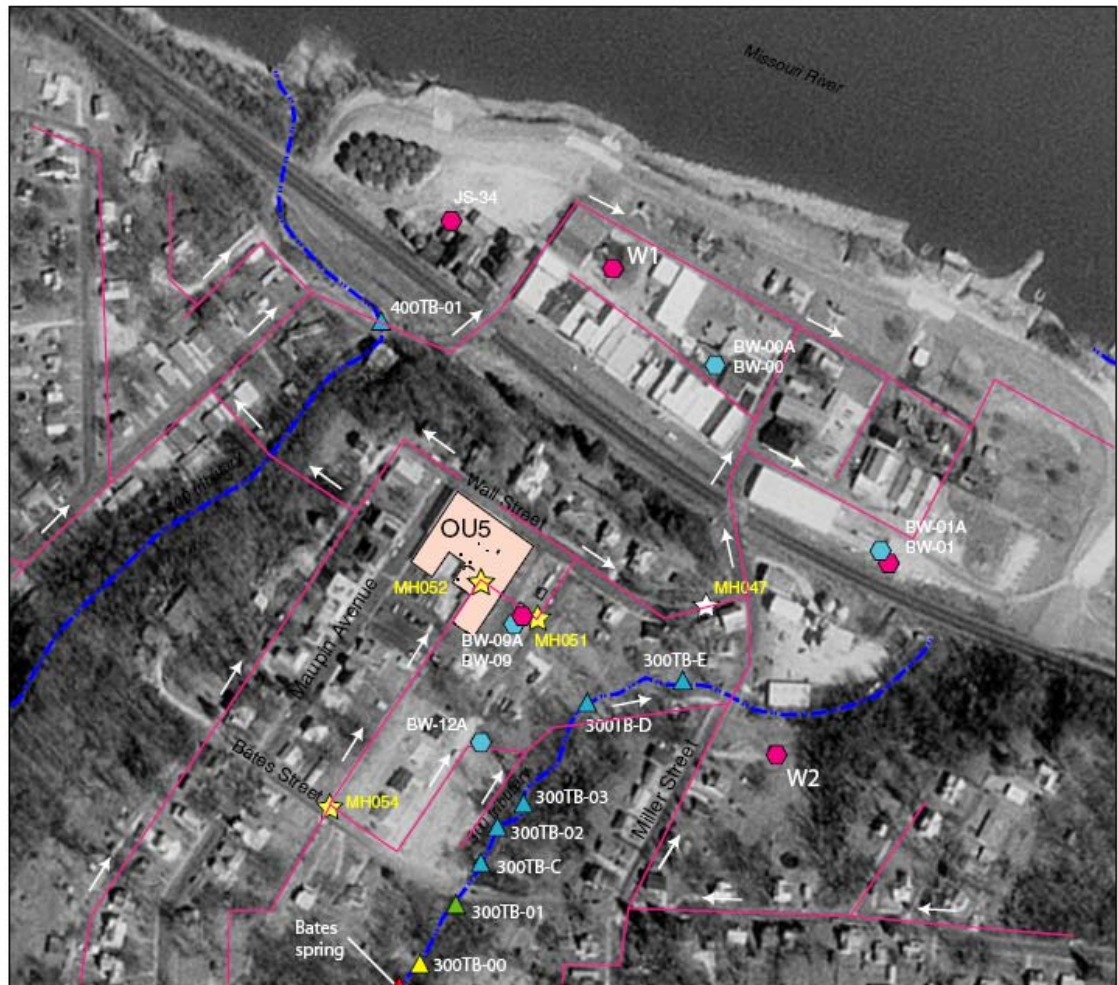
Source: US Environmental Protection Agency, Draft Focused Remedial Investigation of Operable Unit 5, Old Hat Factory. Riverfront Superfund Site, Franklin County, Missouri. 2005.

Figure 2
Operable Units at Riverfront Superfund Site
New Haven, Missouri



Source: US Environmental Protection Agency, Draft Focused Remedial Investigation of Operable Unit 5, Old Hat Factory. Riverfront Superfund Site, Franklin County, Missouri. 2005.

Figure 3
Operable Unit 5, Riverfront Superfund Site
New Haven, Missouri



EXPLANATION

- Stream
- Sanitary sewer line. Arrow indicates direction of flow (note all lines shown are gravity lines)
- Sanitary sewer manhole and number. Yellow indicates samples collected and PCE detected. White indicates not sampled.
- Well and number. Red indicates PCE larger than 5.0 micrograms per liter.

- Surface-water sample site and number. Color indicates maximum PCE concentration detected in micrograms per liter (ug/L).
- Not detected
 - 0.01 to 0.5 ug/L
 - 0.5 to 4.9 ug/L
 - greater than 5.0 ug/L

0 250 500 Feet

Source: US Environmental Protection Agency, Draft Focused Remedial Investigation of Operable Unit 5, Old Hat Factory. Riverfront Superfund Site, Franklin County, Missouri. 2005.

Figure 4
Old Hat Factory and Restoration of Opera House
Operable Unit 5, Riverfront Superfund Site
New Haven, Missouri

Former Hat Factory, 2002 with old
Opera House at far end of building



Restoration of old Opera House after
demolition of Former Hat Factory, 2007



Figure 5
Residences Downgradient and East of OU-5 and Monitoring Well
Operable Unit 5, Riverfront Superfund Site
New Haven, Missouri

